

Product Description Document (PDD)  
**Experimental National Impact Based Warnings**

**Part I - Mission Connection**

a. Product Description – NWS Weather Forecast Offices (WFOs) issue Tornado Warnings (TOR), Severe Thunderstorm Warnings (SVR) and Severe Weather Statements (SVS - a follow-up to a TOR or SVR) as needed for their County Warning Area (CWA) of responsibility during severe convective weather events. These alphanumeric products provide the public, media and emergency managers with advance notice of damaging wind gusts, large hail, and tornadoes that pose a threat to life and property.

- A TOR is issued when there is radar indication and/or reliable reports of a tornado or developing tornado. Hazards associated with severe thunderstorms are nearly always attendant to the tornado threat as well.
- A SVR is issued when there is radar or satellite indication and/or reliable reports of wind gusts of 58 mph or greater, and/or hail of one inch (U.S. quarter-size) diameter or greater.
- The SVS is a “follow-up” statement which provides updated information as to the status of storms within a TOR (or SVR) warning area.

NWS proposes a simple but important change to the existing convective warning system to improve usefulness and effectiveness of severe convective warnings. For SVRs, forecasters will be presented two options within the WFO warning software: (1) a storm (or line of storms) may be identified as a traditional, baseline SVR threat, or (2) cells of interest may be identified as extreme storms, i.e., those with forecast hail of baseball-size or larger ( $>2.75$ " ) and/or wind gusts are predicted to exceed 80 mph (default threshold that may be configured locally).

Invoking the latter choice will trigger inclusion of enhanced verbiage concerning impacts and calls to action. It will also insert a highlight statement such as "This is a very dangerous storm". Finally, the option to include a tag line which explicitly states "TORNADO POSSIBLE" will be available. This messaging which highlights elevated danger may be selected during the issuance of an original warning (SVR) or in a follow-up statement (SVS).

For TORs, forecasters will be provided a number of options to clarify the level of threat based on level of severity.

The first option pertains to the standard or “base” TORs (which are the most common type issued through the season). For these “base” TORs, forecasters will be able to (1) include bullets that plainly and clearly communicate hazard and impact information, (2) utilize enhanced calls to action, as rephrased by social science partners, and (3) add “tags” at the end of the message with additional critical information. This information may include any or all of the following: (a) whether the tornado is observed or radar-indicated (implied statement of confidence in evidence), (b) predicted hail size, and (c) the option to add strength of non-tornadic thunderstorm-related wind. This warning type will be selected for cases in which there is *credible* evidence of a tornado.

The second option will be exercised in cases where there is *substantial* evidence of a tornado coincident with a high impact event. In such cases, the phrase "This is a Particularly Dangerous Situation" (PDS) will be utilized, along with enhanced wording within the second warning bullet to identify a high level of risk, describe expected damage and impacts, and promote serious urgency in taking action to seek shelter immediately. The "PDS" warning will also append an explicit damage threat reference in the form of a tag line code "TORNADO DAMAGE THREAT...CONSIDERABLE", rather than simply discriminating between observed or probable.

The third option will be used only for the most severe type of tornado warning. This option will be reserved for those rare cases in which a known, violent tornado is likely to produce devastating damage. For these situations, the enhanced wording will include a "TORNADO EMERGENCY" announcement, the recommended action will be brief, clear and extremely urgent (e.g., IF YOU ARE IN OR NEAR LIBERTY...SEEK SHELTER IMMEDIATELY!), and the tag line will read: TORNADO DAMAGE THREAT...CATASTROPHIC.

In 2012, five WFOs in the NWS Central Region demonstrated the impact-based convective warning experimental approach within their operational products. The demonstration was expanded to all 38 Central Region offices in the spring of 2013. Based on feedback, the 2014 included some changes from the earlier Central Region demonstration (see below) and the number of WFOs increased to include 5 WFOs within NWS Southern Region (Norman, OK; Tulsa, OK; Jackson, MS; Lubbock, TX and San Angelo, TX); 1 WFO within NWS Eastern Region (Blacksburg, VA); and 2 WFOs within NWS Western Region (Great Falls, MT and Glasgow, MT).

For the 2014 experimental Impact-Based Warnings, the impact statements for "CONSIDERABLE" (second option) and those for "CATASTROPHIC" (third option) served as markers of confidence of tornado occurrence, with both reflecting an "elevated tier" of tornado damage and risk. The term CATASTROPHIC is to be used only when a tornado is striking an actual community.

To keep consistency for ongoing social science studies, and to minimize software changes during the transition from AWIPS 1 to AWIPS 2, the 2015 experimental Impact-Based Warnings will remain unchanged from 2014. The number of participating offices expands from 46 in 2014 to 67 in 2015, including 38 Central Region Offices, 19 Southern Region Offices, 7 Eastern Region Offices, and 3 Western Region Offices. The list of participating offices is found in Part 2b of this document, and at <http://www.weather.gov/media/impacts/IBWContacts.pdf>.

b. Purpose – The purpose of this experiment is to improve the communication of crucial decision support and risk assessment information to partners and users within the guidelines of governing policy and the existing operational environment. The warnings will include streamlined, standardized, concise bullets to convey information about associated impacts, specific hazards expected, and recommended action designed to result in an improved public response to take immediate protective action.

c. Audience-- The target audience for the product includes: national, state and local emergency managers; media partners; the private weather enterprise; government and military agencies; and the general public.

d. Presentation Format – The enhanced wording design to highlight impacts, specific hazards and source of information prompting the warning will be inserted into the text area beneath the third mandatory bullet (immediately following the time, location and motion of the storm). A list of “recommended action” phrases will be selectable in the WFO warning software. The selection will be inserted into the mandatory section labeled “PRECAUTIONARY/PREPAREDNESS ACTIONS”. Relevant tags for Tornado, Hail and Wind will be automatically appended to the bottom of severe convective warnings (TOR, SVR) and follow-up statements (SVS) issued by all participating offices.

e. Feedback Method - Web feedback from the broader community will be sought via the following NWS customer survey link from April 1, 2015 to November 4, 2015:

<http://www.weather.gov/survey/nws-survey.php?code=IBW>

Additional evaluation will be conducted by social science research groups with media partners, emergency management and NWS forecasters using focus groups and surveys

Comments may also be provided to:

John Ferree

NWS Severe Storms Services Leader

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Norman, OK 73072

405-325-2209

[john.t.ferree@noaa.gov](mailto:john.t.ferree@noaa.gov)

## **II - Technical Description**

a. Format and Science Basis – Compelling evidence exists to support the capability of NWS forecasters to differentiate the strong/violent tornadoes from the less damaging tornadoes. Nationwide, 68% of NWS warnings for EF0-1 tornadoes achieve at least 12 minutes lead time (a metric of advance notice measured from warning dissemination to verified occurrence). However, the success rate for advance prediction of EF2-5 tornado warnings is substantially better (94%), as is the average lead time (18 minutes). There are clearly exceptions but, in general, performance metrics indicate a statistically significant skill in detecting and predicting catastrophic tornadoes as compared to all tornadoes. Additional training to reinforce the scientific understanding and warning methodologies needed to diagnose those extreme cases is being provided for the offices participating in this experiment.

The coded tag lines appended to the bottom of every TOR, SVR and SVS products after the double ampersand (&&) directly below the existing TIME...MOT...LOC line and before the double dollar sign (\$\$).

The enhanced wording designed to communicate severity, hazards, and impacts will be inserted into the third mandatory bullet section, which begins “AT <time> CDT...”

The tag lines will be appended to TOR, SVR and appropriate follow-up SVS products, after the double ampersand (&&) and the “Lat/Lon” and “Time/Motion/Location” lines, as follows,

TORNADO...<descriptor; optional for SVR>  
TORNADO DAMAGE THREAT...<descriptor>  
HAIL... x.xxIN  
WIND...xxMPH <optional for TOR>

where x.xx represents the expected maximum hail size in inches, and xx represents maximum expected thunderstorm-induced wind speed.

### **Allowable Coded Tag Line Values**

The allowable values for tornado, hail and wind tag lines are coded and defined as follows:

#### **Tornado Values for TOR and TOR related SVS**

TORNADO...RADAR INDICATED  
TORNADO...OBSERVED  
TORNADO DAMAGE THREAT...CONSIDERABLE  
TORNADO DAMAGE THREAT...CATASTROPHIC

**For SVR/SVS** the tornado tag line typically will not be appended. However when conditions warrant, the option to identify possible tornado formation will be available in the form of the following tag:

TORNADO...POSSIBLE

#### **Hail Values for TOR/SVR/SVS**

(Flexibility is given to local offices to add other events with 0.75 being the lowest allowable specified value, other than “no hail” and “smaller than three-quarter inch” values. The lowest value of hail size considered to meet “severe thunderstorm” criterion is 1-inch in diameter.)

0.00 Equates to no hail  
<.75 Small hail expected  
0.75 0.75 inch hail (penny-sized)  
0.88 0.88 inch hail (nickel-sized)  
1.00 1.00 inch hail (minimal SVR criterion for hail size)  
1.50 1.50 inch hail (ping pong ball-sized)  
1.75 1.75 inch hail (golf ball-sized)  
2.50 2.50 inch (tennis ball-sized)  
2.75 2.75 inch hail (baseball-sized)  
4.25 4.25 inch hail (softball-sized) or larger and is the highest allowable value

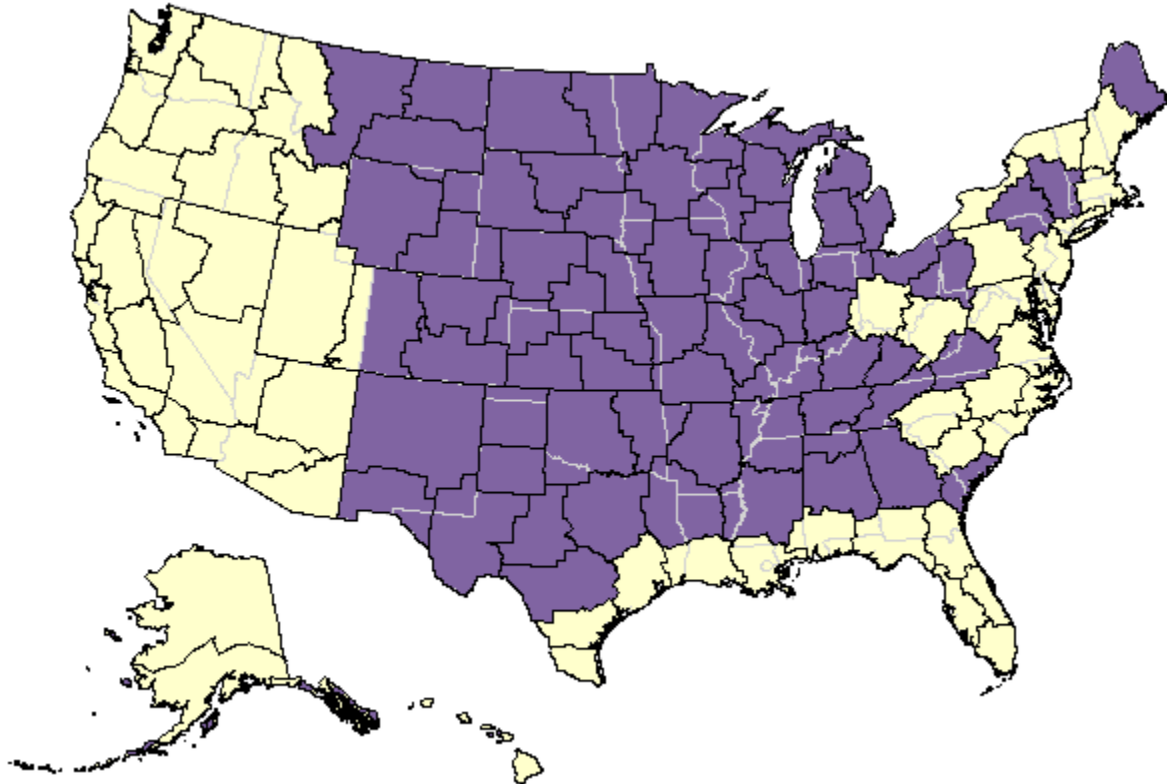
#### **Wind Values for TOR/SVR/SVS**

Dimensions are in MPH. Flexibility is granted to add other events in 5 mph increments, but default template value choices are:

- <50 Wind gusts below severe criteria and lowest allowable value (for SVR hail only)
- 60 60 mph peak wind gust and is the first allowable value above <50 (severe criteria)
- 70 Used for warnings where wind is expected to be GTE 70 mph but LT 80 mph
- 80 Used for warnings where wind is expected to be GTE 80 mph but LT 90 mph
- 90 Used for warnings where wind is expected to be GTE 90 mph but LT 100 mph
- 100 100 mph or higher peak wind gust and is the highest allowable value (significant structural damage)

b. Availability - This enhanced product is available through all distribution channels which currently disseminate TOR, SVR, and SVS warning products.

Map of offices participating in the experimental Impact Based Warnings in 2015:



List of participating offices in 2015 (\* indicates office that participating for the first time) :

<b>Central Region</b>	<b>Southern Region</b>
Aberdeen, SD (ABR)	* Albuquerque, NM (ABQ)
Bismarck, ND (BIS)	* Amarillo, TX (AMA)
Cheyenne, WY (CYS)	* Atlanta, GA (FFC)
Chicago, IL (LOT)	* Austin/San Antonio (EWX)
Davenport, IA (DVN)	* Birmingham, AL (BMX)
Denver/Boulder, CO (BOU)	* El Paso, TX (EPZ)
Des Moines, IA (DMX)	* Fort Worth/Dallas, TX (FWD)
Grand Junction, CO (GJT)	* Huntsville, AL (HUN)
Detroit, MI (DTX)	Jackson, MS (JAN)
Dodge City, KS (DDC)	* Little Rock, AR (LZK)
Duluth, MN (DLH)	Lubbock, TX (LUB)
Eastern North Dakota (FGF)	* Memphis, TN (MEG)
Goodland, KS (GLD)	* Midland/Odessa, TX (MAF)
Grand Junction, CO (GJT)	* Morristown, TN (MRX)
Grand Rapids, MI (GRR)	* Nashville, TN (OHX)
Green Bay, WI (GRB)	Oklahoma City, OK (OUN)
Hastings, NE (GID)	San Angelo, TX (SJT)
Indianapolis, IN (IND)	* Shreveport, LA (SHV)
Jackson, KY (JKL)	Tulsa, OK (TSA)
Kansas City/ Pleasant Hill, MO (EAX)	
LaCrosse, WI (ARX)	<b>Eastern Region</b>
Lincoln, IL (ILX)	* Albany, NY (ALY)
Louisville, KY (LMK)	* Binghamton, NY (BGM)
Marquette, MI (MQT)	* Caribou, ME (CAR)
Milwaukee/Sullivan, WI (MKX)	* Cleveland, OH (CLE)
North Platte, NE (LBF)	* Charleston, SC (CHS)
NC Lower Michigan (APX)	* Pittsburg, PA (PBZ)
Northern Indiana (IWX)	Roanoke/Blacksburg, VA (RNK)
Omaha, NE (OAX)	
Paducah, KY (PAH)	<b>Western Region</b>
Pueblo, CO (PUB)	* Billings, MT (BYZ)
Rapid City, SD (UNR)	Glasgow, MT (GGW)
Riverton, WY (RIW)	Great Falls, MT (TFX)
Sioux Falls, SD (FSD)	
Springfield, MO (SGF)	
St. Louis, MO (LSX)	
Topeka, KS (TOP)	
Wichita, KS (ICT)	

C. Additional Information – Examples of PDS Warning (next page).

**a. Example of a “Considerable” Tornado Warning:**

WFUS53 KILX 171712  
TORILX  
ILC123-179-203-171745-  
/O.NEW.KILX.TO.W.0013.131117T1712Z-131117T1745Z/

BULLETIN - EAS ACTIVATION REQUESTED  
TORNADO WARNING  
NATIONAL WEATHER SERVICE LINCOLN IL  
1112 AM CST SUN NOV 17 2013

THE NATIONAL WEATHER SERVICE IN LINCOLN HAS ISSUED A

\* TORNADO WARNING FOR...  
SOUTHEASTERN MARSHALL COUNTY IN CENTRAL ILLINOIS...  
NORTHEASTERN TAZEWELL COUNTY IN CENTRAL ILLINOIS...  
WOODFORD COUNTY IN CENTRAL ILLINOIS...

\* UNTIL 1145 AM CST

\* AT 1107 AM CST...A CONFIRMED LARGE AND EXTREMELY DANGEROUS TORNADO  
WAS LOCATED NEAR WASHINGTON...AND MOVING NORTHEAST AT 65 MPH.

THIS IS A PARTICULARLY DANGEROUS SITUATION.

HAZARD...DAMAGING TORNADO.

SOURCE...RADAR CONFIRMED TORNADO.

IMPACT...YOU ARE IN A LIFE THREATENING SITUATION. FLYING DEBRIS  
MAY BE DEADLY TO THOSE CAUGHT WITHOUT SHELTER. MOBILE  
HOMES WILL BE DESTROYED. CONSIDERABLE DAMAGE TO  
HOMES...BUSINESSES AND VEHICLES IS LIKELY AND COMPLETE  
DESTRUCTION IS POSSIBLE.

\* LOCATIONS IMPACTED INCLUDE...  
ROANOKE...MINONK...TOLUCA...WENONA...CAZENOVIA...LOW POINT...BENSON  
AND PATTONSBURG.

THIS INCLUDES INTERSTATE 39 BETWEEN MILE MARKERS 22 AND 38.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

TO REPEAT...A LARGE...EXTREMELY DANGEROUS AND POTENTIALLY DEADLY  
TORNADO IS ON THE GROUND. TO PROTECT YOUR LIFE...TAKE COVER NOW. MOVE  
TO AN INTERIOR ROOM ON THE LOWEST FLOOR OF A STURDY BUILDING. AVOID  
WINDOWS. IF IN A MOBILE HOME...A VEHICLE OR OUTDOORS...MOVE TO THE  
CLOSEST SUBSTANTIAL SHELTER AND PROTECT YOURSELF FROM FLYING DEBRIS.

&&

LAT...LON 4094 8904 4093 8894 4093 8893 4088 8893  
4064 8935 4078 8951 4108 8905 4107 8904  
TIME...MOT...LOC 1712Z 230DEG 57KT 4077 8933

TORNADO...OBSERVED  
TORNADO DAMAGE THREAT...CONSIDERABLE  
HAIL...0.00IN  
\$\$

b. Example of a "Catastrophic" Tornado Warning (Severe Weather Statement):  
WWUS54 KJAN 282103  
SVSJAN

SEVERE WEATHER STATEMENT  
NATIONAL WEATHER SERVICE JACKSON MS  
403 PM CDT MON APR 28 2014

MSC007-099-159-282145-  
/O.CON.KJAN.TO.W.0039.000000T0000Z-140428T2145Z/  
ATTALA MS-WINSTON MS-NESHOBA MS-  
403 PM CDT MON APR 28 2014

...TORNADO EMERGENCY FOR LOCATIONS ALONG THE PATH OF THE TORNADO...

...A TORNADO WARNING REMAINS IN EFFECT FOR NORTHWESTERN NESHOBA...  
WINSTON AND EAST CENTRAL ATTALA COUNTIES UNTIL 445 PM CDT...

AT 403 PM CDT...A CONFIRMED LARGE...VIOLENT AND EXTREMELY DANGEROUS  
TORNADO WAS LOCATED FOUR MILES SOUTHEAST OF ZAMA...AND MOVING  
NORTHEAST AT 45 MPH.

THIS IS A TORNADO EMERGENCY FOR LOCATIONS ALONG THE PATH OF THE  
TORNADO. TAKE COVER NOW. THIS IS A PARTICULARLY DANGEROUS SITUATION.

HAZARD...DEADLY TORNADO.

SOURCE...WEATHER SPOTTERS CONFIRMED TORNADO.

IMPACT...YOU ARE IN A LIFE THREATENING SITUATION. FLYING DEBRIS WILL  
BE DEADLY TO THOSE CAUGHT WITHOUT SHELTER. MOBILE HOMES WILL  
BE DESTROYED. CONSIDERABLE DAMAGE TO HOMES...BUSINESSES AND  
VEHICLES LIKELY AND COMPLETE DESTRUCTION POSSIBLE.

THE TORNADO WILL BE NEAR...  
STALLO AROUND 415 PM CDT.  
CENTER RIDGE AND LOUISVILLE AROUND 425 PM CDT.  
VERNON AROUND 430 PM CDT.  
MILLCREEK AROUND 435 PM CDT.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

TO REPEAT...A LARGE...EXTREMELY DANGEROUS AND DEADLY TORNADO IS ON  
THE GROUND. TO PROTECT YOUR LIFE...TAKE COVER NOW. MOVE TO AN  
INTERIOR ROOM ON THE LOWEST FLOOR OF A STURDY BUILDING. AVOID  
WINDOWS. IF IN A MOBILE HOME...A VEHICLE OR OUTDOORS...MOVE TO THE  
CLOSEST SUBSTANTIAL SHELTER AND PROTECT YOURSELF FROM FLYING DEBRIS.

&&  
LAT...LON 3283 8932 3293 8932 3293 8934 3311 8936 3312 8932  
3311 8931 3311 8922 3316 8921 3321 8908 3328 8882 3296 8881  
TIME...MOT...LOC 2103Z 247DEG 37KT 3295 8928

TORNADO...OBSERVED  
TORNADO DAMAGE THREAT...CATASTROPHIC  
HAIL...1.75IN  
\$\$



c. Example of Severe Thunderstorm Warning with Tornado Possible tag:  
WUUS53 KEAX 302316  
SVREAX  
MOC129-171-211-010000-  
/O.NEW.KEAX.SV.W.0167.140630T2316Z-140701T0000Z/

BULLETIN - IMMEDIATE BROADCAST REQUESTED  
SEVERE THUNDERSTORM WARNING  
NATIONAL WEATHER SERVICE KANSAS CITY/PLEASANT HILL MO  
616 PM CDT MON JUN 30 2014

THE NATIONAL WEATHER SERVICE IN PLEASANT HILL HAS ISSUED A

\* SEVERE THUNDERSTORM WARNING FOR...  
SOUTHERN MERCER COUNTY IN NORTH CENTRAL MISSOURI...  
SOUTHWESTERN PUTNAM COUNTY IN NORTH CENTRAL MISSOURI...  
NORTHWESTERN SULLIVAN COUNTY IN NORTH CENTRAL MISSOURI...

\* UNTIL 700 PM CDT

\* AT 615 PM CDT...A SEVERE THUNDERSTORM WAS LOCATED NEAR PRINCETON...  
AND MOVING EAST AT 40 MPH.

HAZARD...PING PONG BALL SIZE HAIL AND 60 MPH WIND GUSTS.

SOURCE...RADAR INDICATED.

IMPACT...PEOPLE AND ANIMALS OUTDOORS WILL BE INJURED. EXPECT HAIL  
DAMAGE TO ROOFS...SIDING...WINDOWS AND VEHICLES. EXPECT  
WIND DAMAGE TO ROOFS...SIDING AND TREES.

\* LOCATIONS IMPACTED INCLUDE...  
PRINCETON...MILL GROVE...HARRIS...NEWTOWN AND LUCERNE.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMAIN ALERT FOR A POSSIBLE TORNADO! TORNADOES CAN DEVELOP QUICKLY  
FROM SEVERE THUNDERSTORMS. IF YOU SPOT A TORNADO GO AT ONCE INTO THE  
BASEMENT OR SMALL CENTRAL ROOM IN A STURDY STRUCTURE.

LARGE HAIL...DAMAGING WINDS AND CONTINUOUS CLOUD TO GROUND LIGHTNING  
IS OCCURRING WITH THIS STORM. MOVE INDOORS IMMEDIATELY. LIGHTNING  
KILLS. REMEMBER...IF YOU CAN HEAR THUNDER...YOU ARE CLOSE ENOUGH TO  
BE STRUCK BY LIGHTNING.

&&

LAT...LON 4047 9307 4022 9316 4025 9337 4027 9337  
4027 9343 4032 9375 4048 9375  
TIME...MOT...LOC 2316Z 273DEG 36KT 4036 9364

TORNADO...POSSIBLE  
HAIL...1.50IN  
WIND...60MPH

\$\$